

Wildlife Disease in Afghanistan

A Concise Field Guide for Afghans

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Preface

This field guide has been designed in an intentionally brief format with hopefully easy to understand technical vocabulary, and serves to highlight, rather than detail, the salient aspects of a selection of diseases relevant to both non-domestic and domestic animals in Afghanistan. It intends to provide veterinarians, paraveterinarians, wildlife biologists, game guards, Forestry and Agriculture personnel, animal control personnel, and students of Afghanistan with a portable reference for diseases common to non-domestic and domestic animals in their country. Those desiring a more in-depth document should seek out relevant literature. It is also designed to accompany the user into the field and should act as a rapid reference source for those encountering sick animals. It provides the reader a brief summary of the cause of the disease highlights the most characteristic symptoms and informs about the associated level of risk to human beings.

The present document is by no means an exhaustive review of wildlife diseases in Afghanistan, but instead focuses for a large part on major diseases reported in Afghan livestock and their guard dogs, which could pose a risk to wildlife. Evidently it does not imply that all diseases of wildlife find their origin in domestic animals (for example rabies is a good example of a disease circulating in wild hosts and that could infect humans, livestock, and dogs and cats), yet desertification, habitat fragmentation, overstocking and global warming are four threats prevailing in Afghanistan, which can separately or in combination increase the risk of disease spill-over from livestock to wild ruminants. We have also included diseases with a known wild reservoir, such as rabies or alveolar hydatid disease, which pose a significant risk to domestic animals or humans, yet diseases that pose only a very occasional risk to domestic animals and humans, such as plague, have not been included.

Almost nothing is known about wildlife diseases in this region of the world, mainly because of its remoteness and the lack of appropriate expertise and surveillance network. As a matter of fact the vast majority of diseases reported in the present document have never been observed in wildlife in Afghanistan. However, because they have been reported at least once in one of the six countries sharing international boundaries with Afghanistan (China, Iran, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan) either in species existing in Afghanistan or in close relatives, they are likely to occur in the future or are possibly already present but remain overlooked. For example foot-and-mouth disease and *Peste des Petits Ruminants*, both reported in livestock in Afghanistan have never been identified in Afghan wildlife, yet they are said to have affected Marco Polo sheep (*Ovis ammon polii*) in Tajikistan and wild goats (*Capra aegagrus*) in Pakistan, respectively.

Because many of the highlighted diseases are transmissible to humans (i.e., zoonosis) this document may also be of interest to human health professionals in Afghanistan and hopefully motivate more in-depth studies of wildlife diseases, a discipline that remains largely unexplored in the region. It is very likely that other diseases common to wild and domestic animals exist in Afghanistan and wait to be discovered. It is indeed our hope that talented Afghan colleagues, based on a new and original set of information, will produce in the future an updated version of this document.

Because of overhunting and livestock overstocking, wild ungulate populations in Afghanistan are fast declining, and as such require our immediate attention. Although disease is probably not the major threat that jeopardizes their existence, we do not know how and to what extent it may influence their demography or pose on the long term a risk of global or local extinction. There is a great need to collect baseline data and develop surveillance operations.

We wish to thank Dave Lawson, country director for WCS Afghanistan for his review of the English version of this document.

Main wild ungulate species of Afghanistan

With more than 50 per cent of the country being mountainous (>1,500 m asl), the ungulate fauna of Afghanistan has many representatives of species especially adapted to mountain habitat. It includes two magnificent wild sheep species, the Marco Polo sheep (*Ovis ammon polii*) and the urial (*Ovis vignei*), three charismatic wild goat species if we count the markhor (*Capra falconeri*) with the Asian ibex (*Capra sibirica*), and wild goat (*Capra aegagrus*), and a smaller species living in more temperate forested areas; the musk deer (*Moschus cupreus*). In addition two species of gazelles; the goitered gazelle (*Gazelle subgutturosa*) and the Indian gazelle (*G. bennettii*) inhabit arid lowlands. The wild ass (*Equus hemionus onager*) and the Bactrian deer (*Cervus elaphus bactrianus*) are probably extinct in the country.

The **Marco Polo sheep** (*Ovis ammon polii*) is a subspecies of argali that inhabits the Pamir mountain range, which in Afghanistan is restricted to the eastern part of Wakhan. Excessive hunting for its meat and impressive horns; habitat destruction from human encroachment and competition with domestic livestock are the primary threats to this species. In the Afghan Pamirs Marco Polo sheep have been observed to come in close contact with free-ranging domestic yak and share pastures with sheep and goats. This proximity raises the concern of the transmission of infectious agents from wild to domestic hosts and vice versa. The Marco Polo sheep may currently total 30-40,000 animals, 85% of them living in the Tajik Pamir. It is currently listed as near threatened on the IUCN Red List, it is on Appendix II of CITES, and within Afghanistan it was recently placed on the Protected List, banning all hunting of this species.



Two subspecies of **urial** may occur in Afghanistan. *Ovis vignei cycloceros* was known to occur throughout the Hindu Kush and the mountains of central Afghanistan, extending from Zebak Mountains in the north to the Seyah Koh range in the southwest. The species is heavily hunted and recently it was reported only from the Hazajarat Plateau and in small numbers. No estimates exist for this subspecies in Afghanistan. Recently a population of 150-200 animals was found in the northern slope of the Hindu Kush in Wakhan. However, this population could belong to *O. vignei vignei* subspecies also present in Northern Pakistan and India. In general urials avoid rugged mountainous terrain favored by ibexes or markhors where they might gain some protection, and instead compete directly with livestock that are seasonally brought into their habitat. Therefore the risk of disease spillover from livestock to urial is expected to be high. Urial population trends in Afghanistan are not known but there is no doubt that *O. o. cycloceros* have declined significantly due to indiscriminate hunting pressure. The urial is listed as vulnerable by the IUCN and both *O. o. cycloceros* and *O. o. vignei* are on Appendix I of CITES. Within Afghanistan urial was recently placed on the Protected List, banning all hunting of this species.



The **markhor** (*Capra falconeri*) is a medium-size wild goat that lives in a variety of mountain habitats including steep gorges, rocky areas, forests and alpine meadows between 600 and 3,600 m asl. Once widespread in Central Asian mountain habitats, its range has fragmented into numerous subpopulations often isolated from each other. In Afghanistan the main population of markhor is thought to remain in monsoon forests of Laghman and Nuristan Provinces, whereas remnant pockets of populations may still occur in Badakhshan, Kapisa and Kabul Provinces. Recently its presence has only been confirmed in central Nuristan and northern Badakhshan.

Markhors are exposed to heavy subsistence hunting throughout their range. In addition a large proportion of their habitat has been lost due to human activities, and particularly timber extraction. As a consequence livestock encroachment into remaining habitats and increased difficulty of gene flow between subpopulations due to physical obstacles may prove fatal to a species confined to relatively small territories. Increasingly the markhor has to forage in close proximity to domestic goats and is therefore liable to infections from contagious agents transmitted from domestic stock. The species is listed as endangered by the IUCN and on Appendix I of the CITES. In Afghanistan the markhor was recently placed on the Protected List, banning all hunting of this species.



The **Asiatic ibex** (*Capra sibirica*) is found in Afghanistan in scattered populations in the Hindu Kush and Pamir mountains ranges. The species seems to be widespread and relatively abundant in north-eastern part of Hindu Kush and Pamirs whereas it seems to be endangered in central and south-western Hindu Kush. Subsistence hunting is said to be the major threat it faces in Afghanistan. Diseases can also be of concern because the species is known to come into contact with livestock. Sarcoptic mange, mycoplasma infection and brucellosis, three diseases spread primarily by livestock have affected ibex populations in several countries. The species is listed as least concern by the IUCN.



In Afghanistan the **wild goat** (*Capra aegagrus*) is probably confined to the Hazarajat and Uruzgan mountains in central Afghanistan, including the arid Feroz Koh and Siyah Koh in the headwaters of the Hari Rud, Farah Rud, Hlemand and Arghandab rivers. Its current status in the country is completely unknown, but if still present it probably suffers overhunting as do all wild ungulates in Afghanistan. Presumably wild goats are susceptible to the same diseases as the Asiatic ibex and markhor because of their genetic closeness. The species is listed as vulnerable by the IUCN.



The **Kashmir musk deer** (*Moschus cupreus*) is endemic to the western Himalayan range where it occurs in coniferous and oak forest habitats between 2,200 and 4,400 m. In Afghanistan, all historical and contemporary records come from the eastern province of Nuristan. Comprehensive population or distribution data on *M. cupreus* does not exist in Afghanistan; however it is well known that this species is heavily poached for food and for musk. Because the species is almost entirely reliant on mountain forests which currently suffer timber extraction, it is assumed to be declining fast. Throughout their distribution range musk deers are also exposed to overhunting for food and musk. The species is listed as endangered by the IUCN and on Appendix I of the CITES. Within Afghanistan the musk deer was recently placed on the Protected List, banning all hunting of this species.



Very little is known about the distribution of the **goitered gazelle** (*Gazella subgutturosa*) in Afghanistan. Its range used to include the western and south-western regions of the country, but by the late 1970s the species had been reduced to a small portion of this range. With no recent data regarding the population of the goitered gazelle in Afghanistan, no population trend can be determined. However, based on data from Pakistan and Iran, it can be assumed that the population is decreasing mainly due to overhunting. In Iran this species is known to be susceptible to lumpy jaw disease and sarcoptic mange. The species is listed as vulnerable by the IUCN. Within Afghanistan the goitered gazelle was recently placed on the Protected List, banning all hunting of this species.



The **Indian gazelle** (*Gazella bennettii*) occurred throughout the arid range of south-west Afghanistan below 1500 m asl. The contemporary status of the species in Afghanistan is unknown. No information is available about the population trends of the Indian gazelle in Afghanistan. Most likely, the population is declining or very rare. The species is listed globally as least concern by IUCN but it would probably qualify as endangered for Afghanistan where it was recently placed on the Protected List, banning all hunting of this species.



The **wild ass** (*Equus hemionus onager*), and the **Bactrian deer** (*Cervus elaphus bactrianus*), two ungulate species, are probably extinct in Afghanistan. The **wild boar** (*Sus scrofa*) survives in riparian and agricultural habitats along the Amu Daria River in Badakhshan, Takhar and Kunduz provinces. The species is not considered at threat.



Stéphane Ostrowski



Stéphane Ostrowski

Large carnivores of Afghanistan

The **Snow leopard** (*Uncia uncia*) is a middle size cat living in mountainous area between 3,000 and 5,000 m of altitude. In Afghanistan it is found in northeast and central parts of the Hindu Kush mountain ranges and in Pamirs. The species is listed as endangered by the IUCN. In Afghanistan the Snow leopard is hunted abundantly because of its precious fur and also as retaliation to livestock predation. It was recently placed on the protected species list of Afghanistan by the National Environmental Protection Agency.



The **Persian leopard** (*Panthera pardus saxicolor*) is the largest subspecies of leopard on earth, with specimens of 80-90 kg being recorded from Iran.. In Afghanistan leopard specimens are said to remain in the Hindu Kush mountain ranges, Koh-e Baba Mountains, Paghman Mountains, Safid Koh and possible Wakhan mountains. Recently the species has been confirmed by a WCS team from the Central Mountain Range of Afghanistan. The main threat for this animal is hunting for fur trading or as retaliation to ungulate destruction. The species is listed as endangered by the IUCN. In Afghanistan the Persian leopard is placed on the protected species list of Afghanistan by the National Environmental Protection Agency.



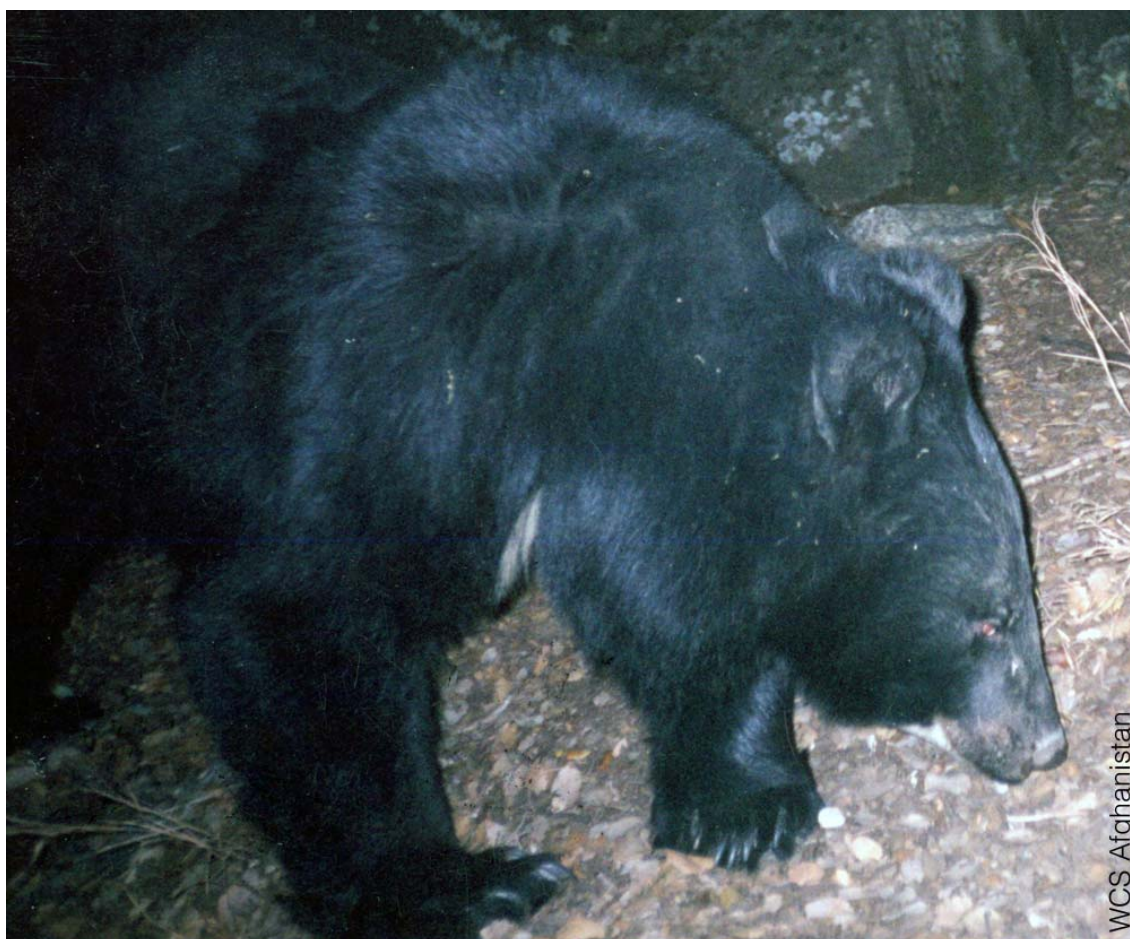
The **Wolf** (*Canis lupus*) is a canid species present across most habitats of Afghanistan. It is heavily persecuted and almost systematically hunted when encountered because of the risk it poses to livestock. Wolf skin is also very popular in the local fur trade. The species is listed as endangered by the IUCN. In Afghanistan the wolf was recently placed on the protected species list of Afghanistan by the National Environmental Protection Agency.



The **brown bear** (*Ursus arctos isabellinus*) is the largest carnivore species in Afghanistan..Recently the brown bear has only been reported in the province of Badakhshan and particularly in Pamirs. Locally the species suffers indiscriminate hunting and habitat degradation. The species is listed as **Data Deficient** by the IUCN. In Afghanistan the brown bear was recently placed on the protected species list of Afghanistan by the National Environmental Protection Agency.



The **Asiatic black bear** (*Ursus thibetanus*) is a relatively small size bear, males weighing about 110-115 kg. The Asiatic black bear is found in forested habitats of eastern provinces of Afghanistan, its main stronghold being possibly the central part of Nuristan. Because the species is known to damage crops and bee hives it is often hunted. Destruction of mothers to sell cubs as pets or dancing animals, mainly in Pakistan, is also damaging the declining population. The species is listed as **Endangered** by the IUCN. In Afghanistan the black bear was recently placed on the protected species list of Afghanistan by the National Environmental Protection Agency.



Personal safety recommendations

Many of the infectious agents affecting wildlife species are potentially dangerous to human beings. The following basic recommendations intend to minimize the risk of transmission of infectious agents to all that work with contaminated tissues or material.

Wash your hands with hot water and soap before putting on gloves and after removing them.

Put on personal protective equipment when examining a sick or dead animal. Ideally face masks, protective glasses, gloves, coverall, hair cover, plastic apron and boot covers are recommended. If part of this equipment is not available, use at least gloves, protective glasses and plastic apron. Never handle a sick or dead wildlife species without wearing disposable gloves.

After handling and sampling, all the clothes mentioned above and necropsy tools should be disinfected in cold soapy water first, then hot water with a detergent, and rinsed with clean hot water. Metal tools used for necropsy should be boiled, dried and stored in dust-free conditions. Disposable items like gloves and plastic aprons should not be washed for re-use but incinerated or buried.

After investigation and sampling the whole carcass of a dead animal should be buried or incinerated.

Do not eat, drink or smoke while working with sick/dead animals.

The place where the carcass of a dead animal is located should be disinfecting with a disinfectant.

After examining a sick or dead animal do not handle cigarettes, lighters or cell phones before thoroughly washing your hands.

If water is not available, use ethanol 70% or any other disinfectant.

If unprotected body parts have been exposed to potentially infectious material (blood, excrements, expectorations, exudates, saliva, pus...), wash abundantly with cold water first then with hot water with detergent and, if available, disinfect with ethanol 70% or another disinfectant.

Avoid having unnecessary people around the investigated animal, particularly children. Locals should not be allowed to handle sick or dead wildlife if not properly trained, it would be better to report to the veterinarian or veterinary auxiliary present in the area.

General diseases

Foot-and-mouth disease (FMD)

What causes FMD?

- A virus transmitted by respiratory aerosols and direct or indirect contacts with infected animal's cause's foot-and-mouth disease.

Where does FMD occur?

- Primarily cloven-hoofed domestic and wild animals. Sheep and goats are considered maintenance hosts. Until now wild animals in Asia have not been confirmed maintenance hosts.
- The disease is endemic in many countries in Asia. In Afghanistan it appears regularly in the form of outbreaks, notably in summer and early autumn. Three serotypes have been reported in the Afghanistan (A, O, and Asia 1).
- So far the disease has not been documented in wild ungulates in Afghanistan.
- Domestic yak in Pamir range are often clinically affected by the disease and occasionally come into close contact with wild ungulates.



What are the signs of FMD?

- Foot-and-mouth disease is characterized by fever and blisters, which progress to erosion in the mouth, nostrils, muzzle, feet, or teat.
- In cattle and yak excess salivation, lameness and decreased milk production are three common symptoms.
- Infected animals may appear weak, tired, and reluctant to move.
- Sheep and goats show very mild, if any, signs of fever, oral lesions, and lameness.
- Animals usually recover in about two weeks, with very low mortality in adults.
- The signs of FMD in wildlife are generally similar to those in domestic animals.
- In gazelles the disease has been responsible of high mortalities due to myocarditis and pancreatitis.



Credit: Rangers of Dornod Province Environmental and Tourism Agency, Mongolia.



How can I protect myself?

- People very rarely get foot-and-mouth disease. The infection when it appears is usually self-limited and wanes after a few days.
- Livestock can be vaccinated against the disease.
- Inform as soon as possible the nearest veterinary authority of any animal suspected of having foot-and-mouth disease.

Can I eat the meat?

- Meat from a diseased animal is suitable for human consumption, yet it is important to follow the decision of the veterinary authority concerning the status of the infected animal.

Samples to collect

- As a reportable disease, sampling of an animal suspected of foot-and-mouth disease should be done by a veterinarian.

Peste des petits ruminants (PPR)

What causes PPR?

- *Peste des petits ruminants* (PPR) is a highly contagious disease caused by a virus.

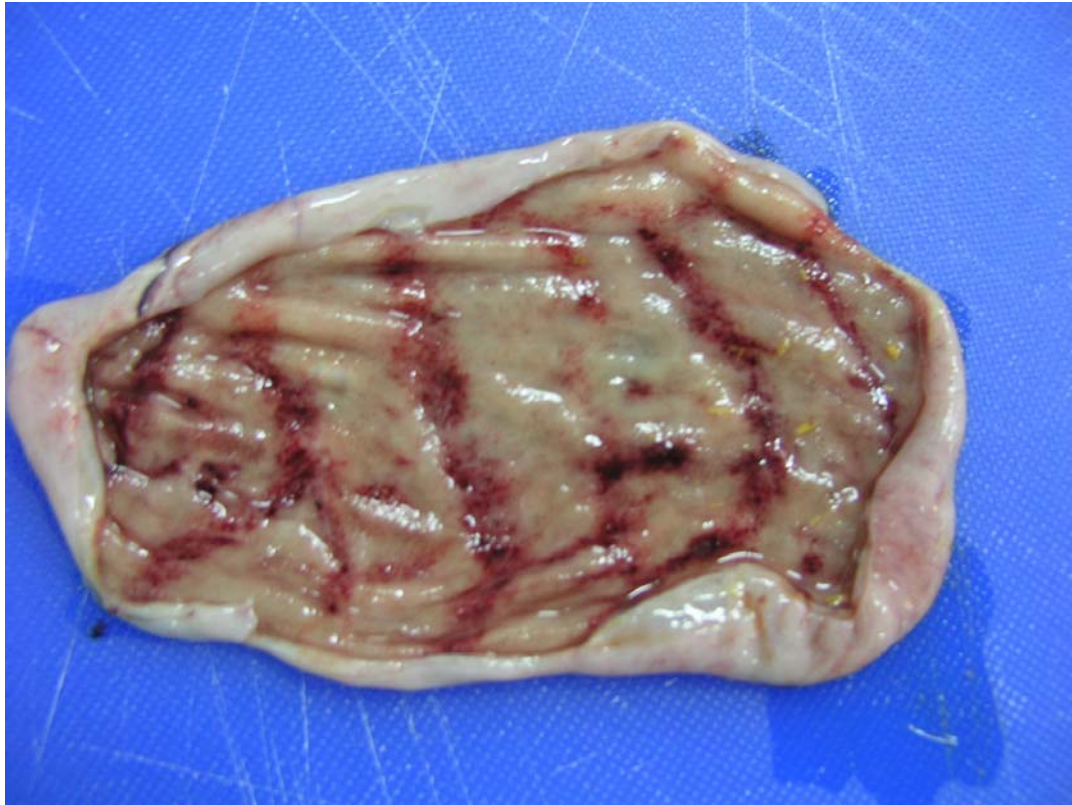
Where does PPR occur?

- PPR infects small ruminants, particularly goats.
- Cattle and yak can be infected, but show no clinical signs and do not transmit the virus to other animals.
- The disease is endemic in Afghanistan.
- In wildlife in Asia the disease has only been documented in captive antelopes.

What are the signs of PPR?

- Most cases of PPR are acute, with a sudden fever, which lasts 5-8 days before the animal dies or starts recovering. Sudden death with few clinical signs is common in goats.
- A characteristic sign is nasal discharge, followed by necrotic erosions in nostrils and in the mouth.

- Animals can also present severe diarrhea, sometimes tinged with blood and/or bronchopneumonia with persistent cough.
- Recovering animals are always weak and may be infected by secondary pathogens.
- Severe diarrhea with hemorrhages sometimes associated with bronchopneumonia is the most frequent syndrome reported in non-domestic ruminants.



Credit: Central Veterinary Research Laboratory, Dubai, UAE.



تصویر 5: گسترش لکه های خونی در غشای مخاطی ابومازوم درگوسفند (*Ammotragus*) barbary sheep
(*lervia*) است که از اثر شکل حاد PPR تلف گردیده.

How can I protect myself?

- You cannot get PPR from infected animals.
- Livestock can be vaccinated against PPR.
- Inform as soon as possible the nearest veterinary authority of any animal suspected of having PPR.

Can I eat the meat?

- Meat from a diseased animal is suitable for human consumption, yet it is important to follow the decision of the veterinary authority concerning the status of the infected animal.

Samples to collect

- Because it is a reportable disease only veterinarians should sample an animal suspected of PPR.

Highly pathogenic avian influenza (HPAI)

What causes HPAI?

- A contagious influenza virus transmitted between birds by fecal droppings, saliva and nasal secretions causes highly pathogenic avian influenza.

Where does HPAI occur?

- The disease mainly infects birds, most commonly domestic poultry and less frequently wild birds, especially waterfowl and shorebirds.
- In rare instances, this virus can be passed to other animals and people.
- A H5N1 strain of the virus appeared in 2003 in Southeast Asia. In rare cases, people have caught this virus and became very ill or died.
- The disease has been reported in Afghanistan in poultries as recently as 2007.

What are the signs of HPAI?

- In very acute form, the bird dies without any symptoms.
- In acute cases in poultry, symptoms are highly variable; usually there is an edema of the head, comb and wattle, which also appear dark in coloration. Sinusitis is common, whereas diarrhea is less frequent.
- Occasionally birds will develop neurological signs with wryneck, gait problems, or paralysis.
- When susceptible, wild birds are most often found dead without symptoms. On rare occasions neurological signs were observed.



تصویر 6: شکل شدیداً بیماریزای انفلونزای پرندگان دریکی بال مرغابی (*Anser indicus*) است که منتج به مرگ و کج شدن گردن آن گردیده است.

How can I protect myself?

- You can get HPAI if you are in close contact with a sick animal or if feces, saliva or any secretion from an infected animal comes into contact with your eyes, nose, lips, or mouth.
- **HPAI is potentially fatal for humans.**
- **Non-professionals should not be allowed to approach a bird suspected of HPAI contamination.**
- Any person exposed to an animal that may have HPAI should **immediately contact the local nursing station or hospital.**
- **Report any mass mortality of wild birds, especially water birds,** to the nearest veterinary authority.

Can I eat the meat?

- Never eat meat from a bird that is suspected to have highly pathogenic avian influenza.
- Do not feed the meat to dogs, domestic or wild cats.
- The carcasses should safely buried or incinerate.

Samples to collect

- Because of the high zoonotic risk and as a reportable disease, only expert staff should sample an animal suspected of HPAI.

Brucellosis

What causes brucellosis?

- Brucellosis is a highly contagious disease caused by *Brucella* bacteria. Most commonly it is spread in the afterbirth and fluids during calving.

Where does brucellosis occur?

- In Afghanistan brucellosis infects livestock, and particularly cattle and yak.
- Although not yet reported in wildlife in Afghanistan, *Brucella* may occur naturally in a variety of wildlife species, including mountain ungulates, gazelles, and wolves.
- *Brucella* can infect humans.

What are the signs of brucellosis?

- Animals may appear healthy and not show any signs of disease.
- Brucellosis usually affects the reproductive organs and leg joints.
- Often, animals will have swollen leg joints causing limping or lameness (especially in the front legs).
- Abortion can be one of the disease sign as well.
- The testicles may be swollen. Females may abort.
- In people brucellosis often causes a high fever that frequently comes and goes.



تصویر 7: پندیدگی مفصل پا ناشی از التهاب مزمن ایجاد شده توسط بروسلا سویس را در یک راس حیوان بنام کاریبو (Rangifer tarandus) نشان میدهد.

How can I protect myself?

- You can get brucellosis through exposure to contaminated parts. The bacteria can enter through cuts or scratches in your skin or through your eyes, nose or mouth. You can also get brucellosis by eating infected meat that has not been fully cooked, raw dairy products or drinking crude milk from infected animals.
- **Do not cut into diseased parts.**
- **Do not spill fluid from the womb onto the meat.**
- Use extreme care and gloves when handling any fetal membranes or aborted tissues.
- The internal organs should be buried or incinerate completely.
- **Wash** your hands, knives and clothes with hot soapy water after handling the animal.

Can I eat the meat?

- Meat from animals with brucellosis should be **thoroughly cooked**.
- Freezing, smoking, drying and pickling **do not** kill *Brucella*.
- Raw bone marrow from infected animals **can** contain the bacteria.
- **Do not feed any parts to dogs.**
- **Report** any animals suspected of having brucellosis to the nearest veterinary authority.

Samples to collect

- Because of the high zoonotic risk, only expert staff is advised to sample an animal suspected of brucellosis.

Bovine tuberculosis

What causes bovine tuberculosis?

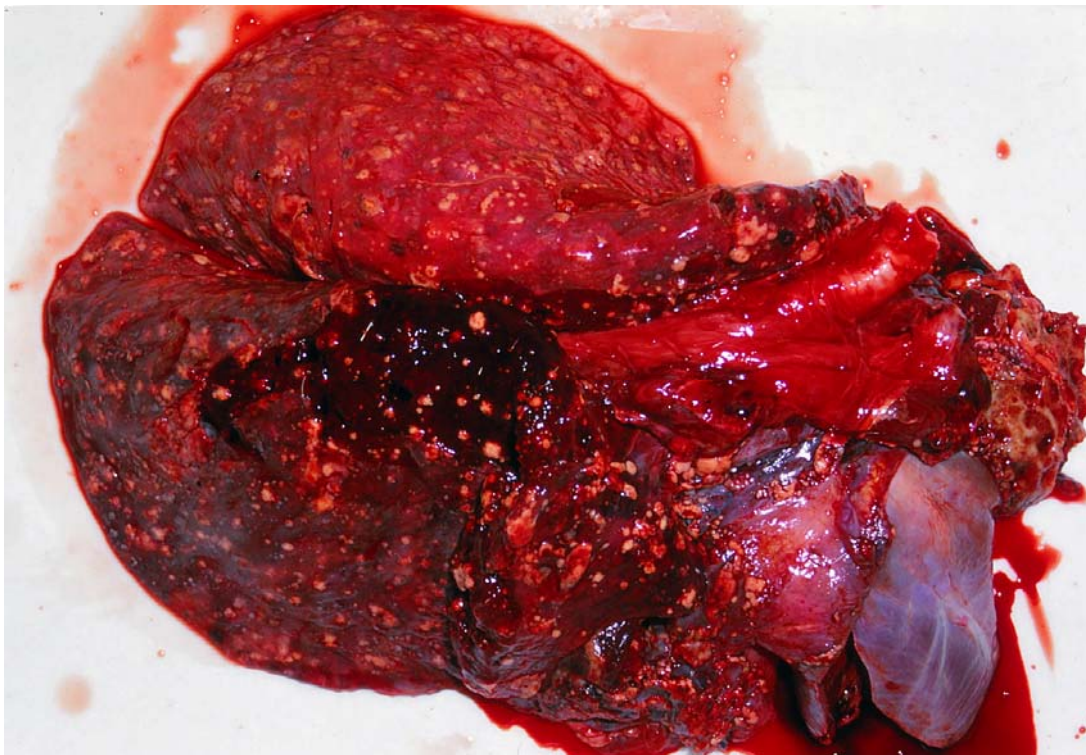
- Bovine tuberculosis is a chronic disease caused by *Mycobacterium bovis* bacteria. Most commonly it is transmitted by the inhalation of coughed particles, by ingestion or through breaks in the skin.

Where does bovine tuberculosis occur?

- In Afghanistan cattle and yak are maintenance hosts for tuberculosis but the disease may occasionally affect other species of mammals (=spillover hosts).
- Although not yet reported in wildlife in Afghanistan, bovine tuberculosis may occur in a variety of wildlife species, including mountain ungulates, gazelles, and carnivores.
- *M. bovis* can infect humans.

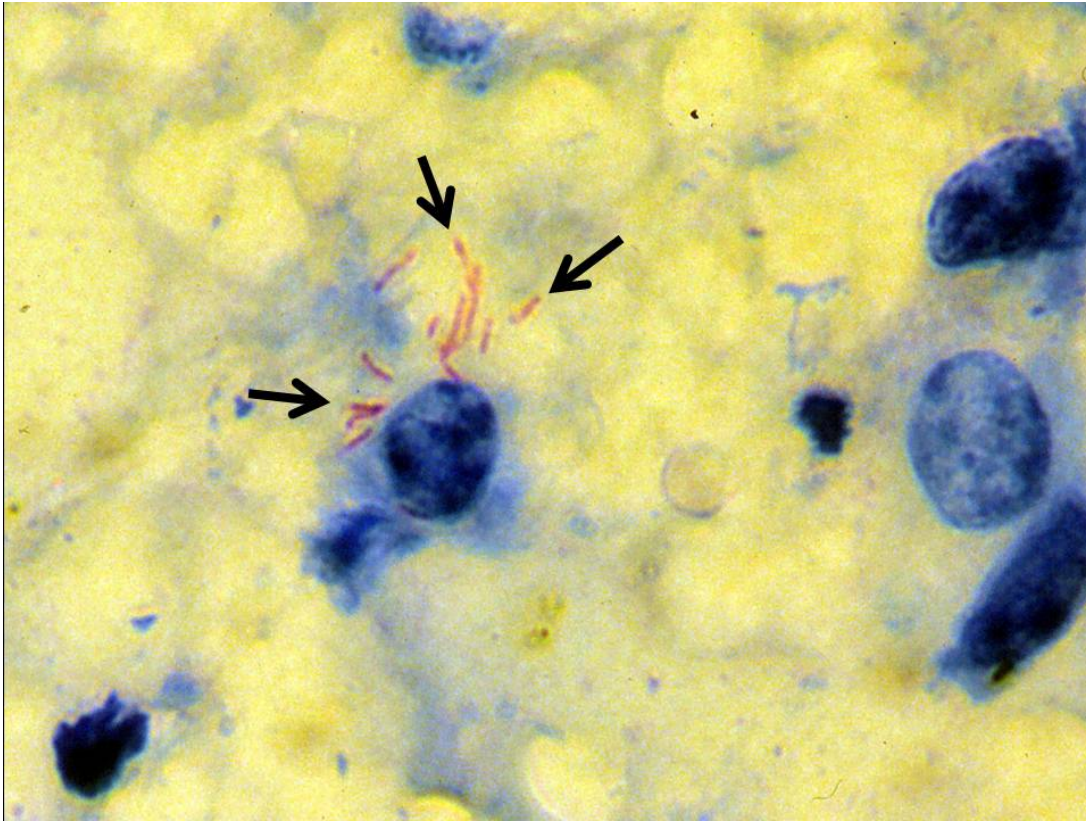
What are the signs of bovine tuberculosis?

- Bovine tuberculosis is difficult to diagnose clinically. It is usually a chronic debilitating disease in cattle, occasionally acute.
- Symptoms differ according to species and affected organs.
- Often, animals will have progressive emaciation, fluctuating fever and moist cough in pulmonary form or intermittent diarrhea and constipation if the digestive tract is involved.
- In people tuberculosis can infect lymph nodes, bones and joint, skin, meninges, genitourinary or pulmonary systems.



تصویر 8: توبرکلوز ریوی، گسترش توبرکلها را در شش یک رأس آهوی غزال عربی (*Oryx leucoryx*) در عربستان سعودی نشان میدهد.

Credit: Veterinary Department, National Wildlife Research Center, Saudi Arabia.



تصویر 9: اشکال مایکوباکتریای عامل توبرکلوز (به رنگ سرخ) است که توسط رنگ آمیزی Ziehl-Neelsen نمایش داده شده است.

How can I protect myself?

- You can get tuberculosis through inhalation of infective aerosols or exposure to contaminated parts. The bacteria can enter through cuts or scratches in your skin or through your eyes, nose or mouth. You can also get tuberculosis by eating infected meat that has not been fully cooked, unpasteurized dairy products or drinking crude milk from infected animals.
- **Do not cut into diseased parts.**
- **Do not manipulate infected organs of animals.**
- Use extreme care and gloves when handling any doubtful tissues.
- **Wash** your hands, knives and clothes with hot soapy water after handling the animal.

Can I eat the meat?

- Meat from animals with tuberculosis should be **thoroughly cooked**.
- Freezing, smoking, drying and pickling **do not** kill *Mycobacterium*.
- Raw bone marrow from infected animals **can** contain the bacteria.
- **Do not feed any parts to dogs and cats.**
- **Report** any animals suspected of having tuberculosis to the nearest veterinary authority.

Samples to collect

- Because of the high zoonotic risk, only expert staff is advised to sample an animal suspected of tuberculosis.

Rabies

What causes rabies?

- A virus spread in the saliva of infected animal causes rabies.

Where does rabies occur?

- All warm-blooded mammals can be infected.
- The disease is endemic in Afghanistan and the most commonly infected animals are carnivores, particularly domestic dogs, foxes, and wolves. Domestic ungulates can also become infected.
- Recently there has been an increase of human contamination in cities via contaminated stray dogs.

What are the signs of rabies?

- Rabid animals often lose their fear of humans and may become vicious and attack for no reason.
- They may have a dropped jaw and appear to be “foaming at the mouth.”
- Rabid animals may appear weak or paralyzed.
- They also sometimes chew rocks, dog chains, and other non-food items.



تصویر 10: روباه سرخ (*Vulpes vulpes*) مبتلا به مرض سگ دیوانه است که حرکت و رفتار غیرنورمال را از خود نشان داده و لعاب دهن آن نیز جاری می‌باشد.

How can I protect myself?

- You can get rabies if you are bitten or licked by an infected animal or if saliva from an infected animal comes into contact with your eyes, nose, lips, cuts or scratches.
- If untreated **rabies is nearly 100% fatal for humans** and signs may be undetectable for weeks or months.
- **Do not go near an animal that you think has rabies.**
- Any person exposed to an animal that may have rabies should **immediately contact the local nursing station or hospital.**
- **Report any animals suspected of having rabies** to the nearest veterinary authority.
- If you must kill an animal that you think has rabies, **do not** shoot it in the head.
- Have domestic dogs and cats vaccinated against rabies.
- There are also vaccines against rabies for humans. If you are in a high-risk area or profession (for example veterinarian), contact your health aide or hospital about getting a rabies vaccination.

Can I eat the meat?

- **Never eat meat from an animal that is suspected of rabies.**
- **Do not feed the meat to dogs or cats.**

Samples to collect

- Because of the high zoonotic risk, only expert staff is advised to sample an animal suspected of rabies.

Canine distemper

What causes canine distemper?

- A contagious virus spread in the saliva and secretions of infected animals causes canine distemper

Where does canine distemper occur?

- The disease is maintained primarily in domestic dog populations worldwide, but its host range is broadening to wild carnivores and expanding geographically.
- The situation of the disease in Afghanistan is unknown but it is expected to be endemic in dog populations. It is also said to affect wild carnivores, especially wolves.
- Canine distemper could be much more common than rabies in dogs in Afghanistan.

What are the signs of canine distemper?

- Domestic dogs with distemper have fever with watery nose and eyes and then pus coming from the eyes or nose.
- They may also sneeze, cough or have diarrhea.
- In wild carnivores the disease often expresses with neurological symptoms. Wild carnivores may lose their fear of humans (like with rabies), they may shiver like they are cold, stumble, fall down, have difficulty to get up again, circle or even lay with convulsions.



تصویر 11: ببر ماده وحشی (*Panthera tigris*) است که از اثر التهاب پرده های مغز علایم عصبی را که توسط عامل مرض دستمپر بمیان آمده است، نشان میدهد. این حیوان در مقابل تحریکات عکس العمل نشان نداده، چشم آن خیره و کور معلوم شده و افرازات شفاف از بینی و چشم آن جاری میباشد.

How can I protect myself?

- The disease is not known to be dangerous to humans.
- Have your dog vaccinated against canine distemper.
- Because it is difficult to distinguish the nervous signs of distemper from those caused by the rabies virus, **any animal showing nervous signs should be considered rabid** and approached accordingly (see paragraph on rabies).

Can I eat the meat?

- Do not feed carnivore meat to dogs and cats.

Samples to collect

- Because of the difficulty to distinguish nervous forms of canine distemper from rabies, sampling of an animal suspected of canine distemper by non-veterinarians is discouraged.

Anthrax

What causes anthrax?

- The disease is caused by a bacterium that can survive for decades in the environment.

Where does anthrax occur?

- The disease affects most mammals, but is particularly important in herbivores.
- Outbreaks are often associated with heavy rainfall, flooding, or drought.
- The disease is reported in livestock in Afghanistan, where it affects in priority sheep, goats, cattle and yak.
- Anthrax may also affect wildlife, particularly wild herbivores.

What are the signs of anthrax?

- In very acute form animals die suddenly without symptoms.
- In acute form the animal presents fever, depression, muscle tremors followed sometimes by blood discharge from nose, mouth and anus, shortly before death.
- Anthrax in wild herbivores varies with the species, but tends to resemble the disease in domestic herbivores.



تصویر 12: جسد تازه یک راس حیوان بنام بایسن (*Bison bison*) است که از اثر مرض انترکس درکانادا تلف گردیده است. احتمالاً ریختن موهای آن ناشی از ورم است که توسط یکی از توکسین های تولید شده توسط باسیل انترکس در جریان بیماری بوجود آمده است.

How can I protect myself?

- You can get anthrax if you are in direct contact with an infected animal or if saliva, blood, or any secretion from an infected animal comes into contact with your skin, eyes, nose, lips, cuts or scratches.
- If untreated the inhalation form (bronchopneumonia followed by septicemia) of the disease is **usually fatal for humans** and signs may be undetectable for weeks.
- **Do not go near an animal that you think has anthrax.**
- **Do not open an animal that you suspect has died of anthrax to avoid contamination of the environment.**
- Any person exposed to an animal that may have anthrax should **immediately contact the local nursing station or hospital.**
- Have your livestock vaccinated against anthrax.
- Remember that anthrax can be present in very old carcasses of dead animals.
- In Afghanistan anthrax in wild herbivores must always be suspected in the event of mass mortality with little external symptoms, especially in areas where the diseases is known to occur.

Can I eat the meat?

- Raw or little cooked meat (<120°C) is potentially dangerous. Meat from an animal that died from anthrax should therefore **not be consumed.**
- There is a high risk of being contaminated when opening or skinning an animal infected by anthrax.

Samples to collect

- Because of the high zoonotic risk, only expert staff is advised to sample an animal suspected of anthrax.

Glanders

What causes glanders?

- It is a serious bacterial zoonotic disease.

Where does glanders occur?

- The disease affects primarily horses, mules and donkeys.
- The disease is endemic in Afghanistan.
- Occasionally glanders may also affect wildlife, particularly wild cats.

What are the signs of glanders?

- Nasal and pulmonary signs are present in the acute form, with high fever, laboured breathing, thick yellow nasal discharge and anorexia. Animals die within days or weeks.
- Chronic form is insidious with intermittent fever, coughing, enlarged submaxillary lymph nodes and chronic nasal discharge. Animals will succumb after several years.
- Presence of nodules on the skin.
- Infected wild cats show purulent to bloody nasal discharge and labored breathing. They die within weeks.



تصویر 13: مخلوطی از افرازات خون و سیروم از سوراخهای بینی ببر سایبریایی (*Panthera tigris*) است که در قید بسر میبرد.

How can I protect myself?

- You can get glanders if you are in direct contact with an infected animal or if saliva, blood, exudates, or any secretion from an infected animal comes into contact with your skin, eyes, nose, lips, cuts or scratches.
- If untreated the disease is **usually fatal for humans**.
- **Do not go near an animal that you think has glanders.**
- **Do not open an animal that you suspect has died of glanders to avoid contamination.**
- Any person exposed to an animal that may have glanders should **immediately contact the local nursing station or hospital.**

Can I eat the meat?

- Raw or little cooked meat (<120°C) is potentially dangerous. Meat from an animal that died from glanders should therefore **not be consumed**.
- There is a high risk of being contaminated when opening or skinning an animal infected by glanders
- In Afghanistan where the disease is endemic and latent forms are common, never feed carnivores with horse/donkey/mule meat.

Samples to collect

- Because of the high zoonotic risk, only expert staff is advised to sample an animal suspected of glanders.

Pleuropneumonia syndrome of small ruminants

What causes pleuropneumonia syndrome?

- It is a group of contagious diseases caused by bacteria known as *Pasteurella*, *Mannheimia* and *Mycoplasma* and transmitted between animals primarily via inhalation of coughed particles.
- These bacteria can act separately or in combination.

Where does pleuropneumonia syndrome occur?

- The syndrome affects sheep and goats worldwide, including in Afghanistan.
- Livestock can harbor these agents without symptoms which increases the risk of insidious transmission to their wild conspecifics.

- This group of diseases has also been reported in a variety of wild ruminant species including the ibex and the markhor.
- In domestic animals the disease affects more severely young animals and often follows a stressful event (poor weather conditions, a sudden change in husbandry, addition of new animals to the herd).
- Because of the relatively good survival of these bacteria in aerosol droplets, the disease can be transmitted over several hundred meters to wild herbivores sharing common pastures with sheep and goats.

What are the signs of pleuropneumonia syndrome?

- Pleuro pneumonia syndrome can be very acute. Animals die suddenly with few clinical signs.
- In acute cases, animals have fever, followed by watery nose soon turning to a yellow-colour discharge. Typically moist cough and labored breathing follow, often shortly before the animal dies.
- When opening the thorax, the cavity is filled with a variable quantity of pleural fluid and the lungs (sometimes only the right lung) show lesions of pneumonia.
- Recovering animals are always weak and may be infected by secondary pathogens.



تصویر 14: گسترش ساحات خاکستری غلیظ در قلب و لوب شش راست همراه با ترشحات مخاطی در برانشهای آهوی مارخور (*Capra falconeri*) مبتلا به *Mycoplasma capricolum subsp. capricolum* در تاجکستان است.

How can I protect myself?

- Humans are not susceptible to pleuro pneumonia syndrome of small ruminants.
- Protective vaccines are available for domestic ruminants.

Can I eat the meat?

- Thoroughly cooked meat from a diseased animal is suitable for human consumption, yet it is important to follow the decision of the veterinary authority concerning the status of the infected animal.

Samples to collect

- Sample pieces of lungs and fluid in the thorax in sterile containers or on specific transport media and freeze them immediately after collection preferably in liquid nitrogen.
- Ideally forward the samples to the laboratory within one week.
- To confirm the lesion (but not its cause) sample 1 cm³ of lung and pleura and store in 10% neutral buffered formalin at room temperature for histopathological examinations. Use a ratio of 1:10 for sample volume to formalin volume.
- Fluid in the thorax and blood can also be sampled on a piece of filter paper and stored at room temperature with no humidity.

Diseases of the head

Nose/sinus bot

What causes nose/sinus bot?

- The larvae of the bot fly cause this condition.
- Lifecycle: The adult female bot fly deposits larvae in the nostrils of the domestic (for example sheep) or non-domestic (argali, ibex) herbivore. Nose/sinus bot larvae attach and grow in a cluster in the nasal cavities, paranasal sinuses or in the throat near the base of the tongue. The larvae are sneezed out in the spring.

Where are nose/sinus bot found?

- Nose bot can be found in domestic and wild sheep throughout Afghanistan. Other wild herbivores are likely affected.

What are the signs of nose/sinus bots?

- Animals usually appear healthy, yet once the larvae begin to move in nasal passages they provoke nasal discharge, coughs and sneezing.
- When larvae reach paranasal sinuses, animals display very few symptoms.
- When laying their eggs, bot flies harass animals and interfere with feeding.
- Nose/sinus bot larvae are found in the nose, sinuses or airways at the back of the throat.
- The worm-like larvae are clear white and small (1-2 mm) when they begin to develop but grow to 2-4 cm in length over the winter and become yellowish-brown.

How can I protect myself?

- Humans are very uncharacteristic hosts for nose/sinus bot flies or their larvae.

Can I eat the meat?

- Meat from an infested animal is suitable for human consumption.

Samples to collect

- Ideally, samples should be killed by immersion into boiling water (>80°C) for 15 to 30 seconds then preserve larvae of bot flies in 80% alcohol (ethanol). Use a ratio of at least 1:5 for specimen volume to ethanol volume.

Keep sample at room temperature.

Coenurosis

What causes coenurosis?

- Several tapeworm species and especially one known as *Taenia multiceps* cause the condition.
- Lifecycle: The adult tapeworm lives in the intestines of canid species (primarily domestic dog but also fox and wolf). The adult tapeworms lay eggs, which are passed to the environment in the feces. Herbivores eat the contaminated vegetation and ingest the eggs, which develop into larvae in the gut cavity. Some larvae migrate to the brain where they bud into a fluid filled cyst called *Coenurus cerebralis*, up to 5-6 cm in size. Carnivores become infected when they eat tissues containing cysts.

Where is coenurosis found?

- Coenurosis is widespread in Central Asia.

- The disease is known to affect wild herbivores, particularly argali and urial.

What are the signs coenurosis?

- Occasionally animals may appear healthy.
- In the majority of cases because of the increased intracranial pressure animals display neurological symptoms.
- Animals may be unable to walk, display paralysis, head deviation, blindness, or abnormal gait.

How can I protect myself?

- Humans are very rarely infested by larvae of *Taenia hydatigena*. When it happens it is caused by the accidental ingestion of contaminated vegetables and fruits.
- Wash your hands with hot soapy water if contaminated by canid or human feces.

Can I eat the meat?

- Meat from an infected animal may potentially harbor larvae and should therefore be **thoroughly cooked**.
- **Do not feed brain or head of an infected animal to dogs.**

Samples to collect

- It is imperative to collect the whole parasite, including the 'head' of adult worms, for proper identification.
- Larvae cysts can be stored in 70% alcohol (ethanol) or 10% neutral buffered formalin.
- Kill adult worm in glacial acetic acid for 2 min. Preserve them in ethanol 70% or best in AFA solution (100 ml formaldehyde 37-40% + 500 ml ethanol 95% + 50 ml glacial acetic acid + 450 ml distilled water) to avoid them coiling.
- Keep samples at room temperature.

Periodontal disease

What causes periodontal disease?

- Bacteria normally found in the mouth of healthy animals cause periodontal disease.

- The bacteria can enter through wounds in the mouth, which can be caused by coarse feed, when teeth break through the gums during development, and in aging animals with impoverished nutrition.

Where does periodontal disease occur?

- Periodontal disease is found in domestic and occasionally wild ungulates such as argali, ibex, and gazelles throughout their distribution.
- The disease does not spread between animals.
- It also affects the ‘upper jaw’ (maxillary bone).

What are the signs of periodontal?

- Infection of the jawbone itself causes firm swellings that can be quite large.
- Swellings contain thick white and yellow pus (abscesses).
- Periodontal disease may interfere with the animal’s ability to eat.
- Other than the swelling on the jaw, animals may appear healthy.
- In wild animals the disease often wanes after several weeks or months.
- Careful examination of jaw and maxillary bone from dead wild animals occasionally reveals bone deformation and osseous proliferation, which are scars of past periodontal disease.

How can I protect myself?

- You cannot get periodontal disease from infected animals.
- Be careful not to cut into pus-filled swellings if handling a fresh carcass. If this happens, pus can be spread and contaminate other parts of the carcass. Wash contaminated hands with hot soapy water.

Can I eat the meat?

- Meat from an infected animal is suitable for human consumption.
- Do not eat the head.

Samples to collect

- Sample pus on general bacterial transport media, if available, or in sterile containers without transport media.
- Immediately store frozen.
- Ideally refer samples to a laboratory within a month.

Diseases of the skin

Contagious ecthyma

What causes ecthyma?

- A virus spread by direct contact with scabs on infected animals causes contagious ecthyma.

Where does ecthyma occur?

- Ecthyma occurs in domestic small ruminants throughout Afghanistan and possibly also in wild ruminants.
- It is most common and severe in younger animals.
- Humans can also be infected.

What are the signs of ecthyma?

- Pocks form into vesicles and thick scabs on the head, mainly on the lips, gum, nose, eyelids, and ears.
- Scabs on the mouth may make it difficult or painful for animals to eat.
- Scabs can also occur on the udder and the top of the foot just above the hoof or between toes.
- If scabs are on the feet, animals may be lame.
- Animals that are heavily infected may be weak.

How can I protect myself?

- You can get ecthyma by touching scabs on an infected animal or by touching anything that has come in contact with the scabs. The virus enters through cuts or scratches in your skin or through your eyes, nose or mouth.
- **Wear gloves.**
- **Do not cut into blisters or scabs.**
- Wash your hands, knives, and clothes with hot soapy water after you finish butchering.

Can I eat the meat?

- Meat from an infected animal is suitable for human consumption.
- Trim off affected parts.
- Severely infected animals may be in poor condition, reducing the quality of the meat.
- **Do not feed infected parts to dogs.**

Samples to collect

- Because you can get the disease, samples should be taken with precautions (gloves, mask, and protective glasses).
- Content of blisters and scabs on virus transport media, if available, or in sterile containers without transport media. Immediately store frozen, preferably in liquid nitrogen. Ideally refer these samples to a laboratory within two weeks.
- For indirect testing blood can be collected, serum or plasma extracted within 12 hours and stored frozen.
- Alternatively blood can be dried on a piece of filter paper and stored without humidity at ambient temperature.

Sarcoptic mange (Scabies)

What causes sarcoptic mange?

- A highly contagious microscopic skin-burrowing mite, known as *Sarcoptes scabiei*, causes sarcoptic mange.

Where does sarcoptic mange occur?

- Sarcoptic mange infects the skin of domestic and wild animals, such as blue sheep (*Pseudois nayaur*) and ibex in Himalaya.
- The disease affects ruminants but can be even more common in carnivore species.

What are the signs of sarcoptic mange?

- Animals infected for a long time are usually in poor body condition.
- Sarcoptic mange is often found on the head and ears, but can occur on other parts of the body in domestic ruminants (for example sheep). Clinical symptoms include persistent and intensive itching, loss of hairs and thickening of the skin, which appears grayish with visible peeling and scabs.
- Intensive itching may also lead to skin bleeding and wounds with pus.
- In blue sheep sarcoptic mange lesions predominate on forelegs and brisket.

How can I protect myself?

- You can get mange from infected animals, yet the infection derived from animals is usually self-limited and wanes after a few weeks.

- You should avoid manipulating without gloves an infected animal.

Can I eat the meat?

- Meat from infected animals is suitable for human consumption. However human exposure may occur while skinning a mangy animal.

Samples to collect

- Scrapes of skin lesions in 70% alcohol (ethanol).
- From a dead animal collect 0.5 cm-thick pieces of abnormal skin in 10% neutral buffered formalin. Use a ratio of 1:10 for sample volume to formalin volume.
- Keep sample at room temperature.

Warbles

What causes warbles?

- Warbles are parasitic larvae of the warble fly.
- Lifecycle: The adult fly lays eggs on the hairs of the ruminant's legs and lower body. The eggs hatch into larvae, which penetrate the skin, and travel under the skin to the animal's back. The warbles grow there until late spring, when they break through the skin and drop to the ground, where they transform into adults.

Where are warbles found?

- Warbles are found in domestic stock in Afghanistan particularly in cattle and yak, but also in wild herbivore species such as in the argali and possible in the urial and ibex.
- It is still unclear whether warble flies infesting domestic and wild animals belong to the same species.

What are the signs of warbles?

- Animals usually appear healthy, although those with heavy infestations may be weak.
- While laying their eggs, warble flies harass animals and interfere with feeding.
- Warble fly larvae are found under the skin on the ruminant's back, where it is often associated with a painful swelling.
- Larvae are yellowish-white, about 3 cm long.

How can I protect myself?

- Warble flies or their larvae cannot infest you.

Can I eat the meat?

- Meat from infested animals is suitable for human consumption.
- Warbles in infested animals reduce the quality of both hide and carcass.

Samples to collect

- Larvae of the warble fly should be preserved in 70% alcohol (ethanol) at room temperature. Respect a ratio of at least 1:5 for specimen volume to ethanol volume.

General parasitic diseases

Alveolar hydatid disease

What causes alveolar hydatid disease?

- A small (3-6 mm) tapeworm known as *Echinococcus multilocularis* causes alveolar hydatid disease.
- Lifecycle: The adult tapeworm lives in the intestines of canid species (primarily red fox and wolf but possibly also other wild canids). The adult tapeworms lay eggs which are passed to the environment in the feces. Rodents (mice, voles) eat the contaminated vegetation and also ingest the eggs, which develop into larvae in their gut cavity. The larvae are enclosed inside of cysts, which form large grape-like clusters in the gut cavity. A fox eats the rodent and also ingests the larvae. The cycle is complete when the larvae mature into adults, which release eggs in the intestine of the fox.
- Dogs can also harbor the adult stage of the tapeworm in their intestine. Humans can develop larval cysts in their liver and less frequently lungs and digestive tract if they ingest eggs shed in fox or dog feces.

Where does alveolar hydatid disease occur?

- This disease is reported in domestic dogs and humans in Afghanistan.

What are the signs of alveolar hydatid disease?

- Infested dogs and foxes show no outward signs of disease.
- Infested rodents may appear bloated due to the large larval cysts in their gut cavity.
- If the gut cavity of an infected rodent is opened, the large grape-like clusters will be easily observed.

How can I protect myself?

- Humans are susceptible to this parasite, which can be fatal.
- The larval stage of the parasite found in rodents poses no threat to humans.
- Humans should wear gloves when cleaning up dog feces or handling feces of wild canid species, and wash hands thoroughly afterwards.
- If possible preventively treat domestic dogs regularly.
- Dispose and burn dry dog feces to avoid contact with parasite eggs.

Can I eat the meat?

- People should not eat rodent or fox meat.

Samples to collect

- Because you can get the disease, samples should be taken with great precautions (gloves, mask, and protective glasses).
- Larvae cysts and adult worms can be stored in 70% alcohol (ethanol) or 10% neutral buffered formalin at room temperature. Droppings from carnivores can be preserved in 10% neutral buffered formalin.
- Kill adult worms in glacial acetic acid for 2 min; preserve them in 70% ethanol.
- Keep samples at room temperature.
- For epidemiological screening feces samples should be kept frozen.

Cystic hydatid disease

What causes hydatid disease?

- The larvae of the small (3-5 mm) tapeworm *Echinococcus granulosus* cause cystic hydatid disease.
- Lifecycle: The tapeworm needs two hosts: a carnivore (for example wolf or dog) and an herbivore (sheep). The adult tapeworms grow and lay eggs in the intestines of the carnivore.

The eggs come out in the carnivore's droppings and contaminate plants, which are eaten by the herbivore. The eggs hatch into larvae that travel to the herbivore's liver, lungs, brain where they form cysts. Carnivores become infected when they eat organs that contain cysts.

Where does hydatid disease occur?

- The adult tapeworm occurs in the intestines of wolves and dogs.
- The larval form or cyst occurs in domestic and wild ruminants, and can also occur in humans.

What are the signs of hydatid disease?

- Carnivores and herbivores usually appear healthy.
- In herbivores, the cysts have thick walls and are filled with a clear watery liquid.
- Cysts are usually found in the lungs and liver but can also occur in the brain or other organs.
- Cysts can be 2 to 30 cm in diameter, but most are 2 to 8 cm.
- The surrounding tissue is usually normal.

How can I protect myself?

- You **can** be infected from tapeworm eggs found in the droppings of carnivores such as wolves or dogs.
- **Wear gloves when handling scats from canid species.**
- The lung cysts in wild herbivores do not infect people.
- Treat domestic dogs regularly; keep dog places as clean as possible. Also, use care when handling dog litters and other substrates that may be contaminated with *Echinococcus* eggs.
- When skinning wolves and foxes, keep in mind that the eggs of this parasite can cling to the fur around their tail and anus.

Can I eat the meat?

- Meat from infected animals is suitable for human consumption.
- **Do not eat any tissues or organs containing cysts.**
- Dogs and wolves can be infected from eating cysts in organs of wild herbivores and spread the disease to people in their droppings.
- **Do not feed infected parts to dogs.**

Samples to collect

- Because you can get the disease, samples should be taken with precautions (gloves, mask, and protective glasses).

- Larvae cysts can be stored in 70% alcohol (ethanol) or 10% neutral buffered formalin. Droppings from carnivores can be preserved in 10% neutral buffered formalin.
- Kill adult worm in glacial acetic acid for 2 min and preserve them in 70% ethanol.
- Keep samples at room temperature.
- For epidemiological screening feces samples should be kept frozen.

Liver tapeworm cysts

What causes liver tapeworm cysts?

- The larvae of the tapeworm *Taenia hydatigena* cause this condition.
- Lifecycle: The tapeworm needs two hosts: a carnivore (for example wolf or dog) and an herbivore (for example wild sheep or domestic sheep). The adult tapeworm grows and lays eggs in the intestines of the carnivore. Eggs come out in the carnivore's droppings and contaminate plants that are eaten by the herbivore. The eggs hatch into larvae that travel to the herbivore's liver where they form cysts. Carnivores become infected when they eat liver containing cysts.

Where do liver tapeworm cysts occur?

- The adult tapeworm occurs in the intestine of carnivores (wolves, lynx, dogs and cats) without causing any harm.
- The larval stage of this tapeworm can occur in a variety of domestic and wild herbivores.

What are the signs of liver tapeworm cysts?

- Carnivores (dogs, wolves) and herbivores (sheep, cattle) usually appear healthy.
- In the herbivore intermediate host, the larvae form small cysts, which may appear like a small circular "window" on the surface of the liver. There also may be white, star-like scars on the surface of the liver.

How can I protect myself?

- The cysts of *T. hydatigena* that occur in herbivores cannot infect you.
- Cysts can be easily removed during butchering.

Can I eat the meat?

- Meat from infected animals is suitable for human consumption.
- Cooking will kill the parasite.

- Dogs can be infected with tapeworms if they eat the liver cysts.
- **Do not feed infected parts to dogs.**

Samples to collect

- It is imperative to collect the whole parasite, including the ‘head’ of adult worms, for proper identification.
- Larvae cysts can be stored in 70% alcohol (ethanol) or 10% neutral buffered formalin at room temperature. Droppings from carnivores can be preserved in 10% neutral buffered formalin.
- Kill adult worms in glacial acetic acid for 2 min, preserve them in 70% ethanol or AFA solution (see coenurosis).

Lungworms

What causes lungworm infections?

- A variety of roundworm parasites are known as “lungworms” (for example *Dictyocaulus viviparus*, *Protostrongylus* spp.).
- Lifecycle: Adult worms are found in the lungs where they lay eggs that hatch into larvae. The larvae are coughed up, swallowed, and passed in the animals’ droppings. In some lungworms, a snail or slug takes up the larvae where they develop into an infective stage. The snails are then eaten by herbivores when feeding on plants. The larvae penetrate the animal’s intestines and travel to the lungs where they develop into adult worms. Other lungworms do not need a snail or slug host. The larvae develop into the infective stage on plants that are then eaten by the herbivore.

Where do lungworm infections occur?

- Lungworms are found in domestic herbivores.
- In Afghanistan different lungworms may also occur in wild herbivores.

What are signs of a lungworm infection?

- Animals often appear healthy.
- Animals with severe infections may cough and have difficulty breathing, especially after running. They are generally weak and thin and have a harsh, dull hair coat.
- When butchering, you may find adult worms or small round gray lumps of dead tissue up to 2 cm in diameter in the lungs.
- Lungworms are white, threadlike worms that range in size from 0.1 to 10 cm long.

How can I protect myself?

- You cannot become infected by lungworms.

Can I eat the meat?

- Meat from infected animals is suitable for human consumption.

Samples to collect

- Kill adult lungworms by dropping them for 2 min in glacial acetic acid and then preserve them in Berland's fluid (5 ml formaldehyde 37-40% + 95 ml of glacial acetic acid). Use a ratio of at least 1:5 for specimen volume to Berland's fluid volume.
- Keep samples at room temperature.

Trichinosis

What causes trichinosis?

- Trichinosis is caused by a roundworm named *Trichinella spiralis*.
- Lifecycle: The adult roundworms mate in the intestines of the host animal. The adult females produce larvae that travel in the blood to other parts of the body where they form cysts in the muscle. Some larvae can also be spread in the environment via feces and retain infectivity. Animals become infected when they eat meat with cysts or larvae in the environment.

Where does trichinosis occur?

- Trichinosis can virtually infect any mammal species.
- In wildlife it occurs principally in carnivores, such as bears, wolves, foxes, lynx, but also wild boars and ground squirrels.
- Pigs and to a lesser extent horses are important hosts for *Trichinella* worm.
- Humans and dogs can also get trichinosis by eating infested meat.

What are the signs of trichinosis?

- Most often animals appear healthy.
- Trichinosis is hard to detect when butchering because there are few signs.
- Larvae (0.1 cm coiled) form cysts usually in the muscles of the jaw, tongue, and diaphragm.
- Cysts are 0.1-0.2 cm in diameter and may therefore not be visible to the naked eye.

- Animals may have swollen intestines with small bruises.
- Affected muscles and associated lymph nodes (glands) can be soft and swollen.

How can I protect myself?

- You **can** get trichinosis by eating meat from infected animals that has not been thoroughly cooked.
- All bear and lynx meat should be considered possibly infected.
- Cook meat thoroughly particularly from horse.

Can I eat the meat?

- People can get trichinosis by eating infected meat that has not been adequately cooked.
- **Meat should be well cooked** (internal temperature of meat should be at least 60°C).
- Freezing, smoking, drying, salting and microwaving **may not** kill the larvae.
- **Do not feed infected parts to dogs.**

Samples to collect

- Because you can get the disease, samples should be taken with precautions (gloves, mask, and protective glasses).
- 50 g of tongue, jaw or diaphragm muscles must be sampled, stored refrigerated at +4°C if the laboratory investigation is possible within one week or in liquid nitrogen for a longer delay.
- For indirect testing collect blood, extract serum or plasma within 12 hours and store frozen.
- Alternatively, dry blood or meat juice on a piece of filter paper and store it without humidity at room temperature.

Other Disorders

Abscesses

What causes abscesses?

- An abscess is a pocket of pus in an animal's tissue. It is usually caused when a wound becomes infected.

Where do abscesses occur?

- They may occur in any species of animal and anywhere on or inside body, and in any tissue.

What are the signs of abscesses?

- Animals usually appear healthy and may not show any signs of disease.
- Usually, they are firm lumps of white fibrous tissue filled with thick white or green pus.

How can I protect myself?

- Be careful not to cut into or touch an abscess. If this happens, pus can be spread and contaminate other parts of the carcass. Wash immediately contaminated hands with warm water and soap.

Can I eat the meat?

- Portions of meat containing abscesses **should not be eaten.**
- The rest of the meat is suitable to human consumption.

Samples to collect

- Sample pus on general bacterial transport media, if available, or in a sterile container without transport media.
- Immediately store samples frozen.
- Ideally refer these samples to a laboratory within two weeks.

Hoof rot

What causes hoof rot?

- The bacteria that can grow without oxygen known as *Spherophorus necrophorum* and *Bacteroides melaninogenicus* cause this disease.
- These bacteria are normal inhabitants of the soil and can also be found in the mouth and intestinal tract of many species of animals.
- Bacteria often enter a susceptible host through a break in the skin between the hooves.

Where does hoof rot occur?

- This disease is contagious and has been described in many species of wild ungulates, particularly gazelles.
- Outbreaks of disease are most common and most severe during periods of extended rainy weather when humidity causes the skin between toes to crack.

What are the signs of hoof rot?

- Abscesses form directly between toes and above the hoof. The hoof may swell 2–3 times its normal size and is extremely painful. The abscess contains thick, foul-smelling pus.
- Infected gazelles often limp and frequently die of starvation.
- Abscesses may also be found in other locations, such as the liver, lungs or mouth.

How can I protect myself?

- People are theoretically susceptible to infection.
- Humans should avoid direct contact with pus-filled abscesses.

Can I eat the meat?

- The meat of animals with hoof rot is safe to eat.
- Burry or incinerate the infected legs. Cook the remainder of the meat thoroughly.

Samples to collect

- Because you can get the disease, samples should be taken with precautions (gloves, mask, and protective glasses).
- Sample abscesses on general bacterial transport media, if available, or in sterile containers without transport media.
- Immediately store frozen.
- Ideally refer these samples to a laboratory within a month.

Injuries

What causes injuries?

- Injuries are common in wild animals.
- Animals can often survive even with bad injuries such as broken bones.
- There are four major causes of injuries in wild animals: vehicle collisions, gunshot and snare wounds, fighting with other animals of the same species, predation.

What are the signs of injuries?

- Gunshot wounds, particularly those from low caliber weapons, may be difficult to see through the animal's hair. They are more visible on the flesh side of the hide.

- Serious injuries caused by fighting between animals of the same species are uncommon. Occasionally, dead animals are found with gore wounds or bite wounds (for example in wolves) on the throat and neck, or horn wounds on the neck, head and thorax (gazelles).
- When related to predation, wounds are usually found on the neck, head and hind legs and sometimes on the flank. Blood is usually found at a distance from the animal.
- There is usually a lot of blood and fluids that collects under the skin and extends for some distance in one direction from the wound.
- Teeth marks may not always perforate the hide but there is usually a bruise or bleeding in the skin at the site.

How can I protect myself?

- Injuries are of no danger to humans.

Can I eat the meat?

- Meat from an injured animal is suitable for human consumption, although consumer must be aware of the presence of lead shots in case of gunshot wound.
- Trim off injured and contaminated parts.
- Severely injured animals may be in poor condition, reducing the quality of the meat.

Samples to collect

- In case of suspected gunshot try to collect evidences of projectile damages (perforated bones) or the projectile itself.
- In case of an infected injury, collect pus or necrotic tissue on general bacterial transport media, if available, or in sterile containers without transport media.
- Immediately store frozen.
- Ideally refer these samples to a laboratory within a month.

Starvation/malnutrition

What causes starvation-malnutrition?

- Starvation occurs when an animal is unable to get the amount of energy or nutrients from food that is required to cover its daily needs.
- There may not be enough food available, or the animal may not be able to reach or get nutrients from food because of environmental factors (deep snow) or physical problems (injury, disease, poor teeth).

When does starvation-malnutrition occur?

- Starvation and malnutrition can affect any wild or domestic species and particularly young, old, weak, or sick animals.
- It usually occurs in winter, often towards the end of this season.

What are the signs of starvation-malnutrition?

- In severe cases animals appear weak and very thin.
- The skin may appear loose with a dull, rough hair coat.
- Wild animals in final stage of starvation have all ribs visible, hips protruding and are often so weak that they are unable to escape approaching predators and humans.

Can I eat the meat?

- In theory meat from a starved animal is suitable for human consumption, yet of very poor quality.
- It should be remembered also that starvation could result from a disease, and one should always look for signs of such underlying problems, which could ultimately render the meat unsuitable for human consumption.

Samples to collect

- Collect and weigh (± 0.1 g) marrow tissue from long bones, and store in clean containers.
- Keep samples frozen.

Exertional myopathy

What causes exertional myopathy?

- Exertional myopathy is a muscle disease that can occur when wild or domestic animals are chased, handled or stressed.

Where does exertional myopathy occur?

- It is most commonly seen in ungulates (hoofed animals), but has been reported in a wide variety of wild animals and birds (for example ducks).

What are the signs of exertional myopathy?

- Animals may appear depressed, weak and stiff. In severe cases they can produce red-brown urine.
- The muscles, heart and kidneys are usually affected but signs may be difficult to see.
- There may be differences in the color and textures of muscle groups.
- Early in the disease, affected muscles may look wet and have small bruises. Later, the muscle becomes pale, dry, and very soft. In severe cases, entire muscles may be torn.
- The heart muscle may have pale areas or streaks.
- Lungs are usually dark and wet.
- In bad cases kidneys may be dark brown.

How can I protect myself?

- The disease is not dangerous to humans.

Can I eat the meat?

- Meat from a diseased animal is suitable for human consumption.
- Severely affected animals may be in poor condition, reducing the quality of the meat.

Samples to collect

- Sample 1 cm³ of damaged muscle, kidney and heart in 10% neutral buffered formalin.
- Store samples at room temperature.